

INNOVATION IN LEARNING: DESIGNING KELADI APPLICATIONS USING C#

**Muhammad Bahrul Ilmi, Nadia Costarika Simanjuntak, Saiba Al Husna,
Hanfiandi Akbar Siregar, Fahmy Syahputra**

Informatics and Computer Technology Education Study Program, FT UNIMED, Medan
Jl. William Iskandar Ps. V Medan, Indonesia
bahrulmuhammad13@gmail.com

Abstract

Technological developments such as the development of digital-based learning media have a major impact on the world of education. This study aims to design and develop the KelaDi (Digital Class) application using Visual Studio and the C# programming language as an interactive learning media for students. The KelaDi application has various features that support the teaching and learning process, such as e-books and e-book readers, learning videos, uploading assignments, and quizzes. The methodology used in this study is a qualitative methodology using the Waterfall model software development approach. The development process includes the stages of requirements analysis, system design, coding and testing program. Supporting software includes Visual Studio 2019 and SQL Server Management Studio 20 software. This program is built using NET 4.7.2 framework technology with the C# programming language. The author hopes that the birth of this program can help support digital-based learning.

Keywords : *visual programming, learning media, KelaDi, Visual Studio, C#*

1. INTRODUCTION

The development of information and communication technology has a major impact on various aspects of life, including education. The digitalization of education provides opportunities for educators to use interactive learning media, which not only enrich the learning process but also increase student engagement and motivation. One of the innovations born from technological advances is the development of software-based learning media applications that allow students to learn independently, in a structured, and more flexible manner.

However, traditional learning methods commonly used in classrooms still face various challenges, including: limited resources, lack of active interaction between students and teachers, and minimal access to relevant digital materials. Therefore, solutions are needed to overcome these challenges and enable a more interactive and engaging learning process.

This study aims to develop the KelaDi (Kelas Digital) application, an interactive learning media based on C# developed using Visual Studio 2019. This application provides several important features that support modern learning needs such as: e-books and e-readers, learning videos, uploading assignments, and interactive quizzes. This application aims to provide a more enjoyable, flexible and effective learning experience to students.

The KelaDi application was built using the Waterfall methodology, which includes the stages of needs analysis, design, development, testing, and implementation. Each stage was developed with attention to the quality of the user experience and user interface so that the application can be used easily by students and teachers. In addition, qualitative methodology was used to collect and analyze data

related to this application, both in terms of usability and effectiveness in improving learning.

Through this research, it is expected that the KelaDi application can be a learning media that supports a more dynamic and relevant teaching and learning process with current technological developments. This study also attempts to measure the extent to which this application can be accepted by students and teachers, as well as its impact on increasing student motivation and learning outcomes.

2. LITERATURE REVIEW

The theoretical study in this study focuses on the concepts underlying the development of interactive learning media, as well as the application of the methodology used in creating the KelaDi application. Some relevant theories in this study include:

2.1. Constructivist Learning Theory

According to this theory, learning occurs when students actively construct their knowledge through experiences and interactions with the environment. The KelaDi application is designed to support active learning with features such as interactive quizzes and learning videos that stimulate student engagement [1].

2.2. Waterfall Software Development Model

The Waterfall Model is a systematic method that involves a series of sequential stages in software development. Each stage must be completed before proceeding to the next stage, ensuring that all functional and non-functional requirements are met [2].

2.3. E-learning and Multimedia

The use of multimedia technology in learning, such as videos and e-books, has been shown to

improve students' understanding of the material. Interactive learning media allows students to access a variety of content, making the learning process more interesting and effective [3] [4].

2.4. User Interface (UI) in Application Design

Good user interface (UI) design is essential to creating a positive user experience. The KelaDi app prioritizes ease of navigation and accessibility to ensure that students and teachers can use the app effectively and efficiently [5] [6].

3. RESEARCH METHODS

This study uses a qualitative approach and Waterfall model software development methodology to design and develop the KelaDi application as an interactive learning media. This methodology is divided into several stages, namely analysis, architecture, and methods used to solve the problems of developing the KelaDi application program to be created.

3.1. Analysis Stages

The analysis stage is the initial step in developing the KelaDi application. At this stage, data collection is carried out to understand user needs, both from students and teachers. Data collection methods used include surveys and literature studies. The result of this analysis is a detailed requirements specification, which includes important features that must be present in the application, such as e-books and e-book readers; learning videos; upload assignments; and interactive quizzes [1] [7].

3.2. Architecture

After the analysis stage is carried out, the next step is the process of designing the KelaDi application system architecture. The application architecture is designed to support the features that have been determined and ensure the application runs well. At this stage, flowcharts and system architecture diagrams are created to describe the interactions between application components. The KelaDi application is built with a client-server-based architecture, which separates the user interface (client) from the code logic, visuals, and database (server) to increase modularity and ease of maintenance [3] [4].

3.3 Development Methods

The method used to solve problems in developing the KelaDi application is the Waterfall method [5]. This method consists of several sequential stages, namely:

- Identify, analyze, and document functional and non-functional requirements for the application to be built.
- Design the application structure and interface (UI) based on requirements specifications.

- Implement and build applications using Visual Studio 2019 and C# programming language with NET.Framework 4.7.2 [2].
- Carry out tests to ensure the application functions as expected and there are no bugs.

4. RESULTS AND DISCUSSION

The results and discussion of this study include the development and testing of the KelaDi application as an interactive learning media. This application is designed to meet the needs of users, namely students and teachers, with various innovative features. The following are the results obtained from the development of the KelaDi application:

4.1. System Analysis

System analysis is a crucial step in developing the KelaDi application as an interactive learning media, which aims to identify and evaluate problems, opportunities, obstacles, and expected needs. Through interviews with students and teachers, it was found that access to integrated learning materials was still difficult, as well as inefficient assignment collection. However, there is an opportunity to improve the learning experience through the integration of multimedia content and student collaboration. From this analysis, improvements are proposed in the form of developing a more user-friendly interface and providing training for students and teachers to maximize the use of the application. Mistakes in this analysis stage can have a negative impact on the next stage, so it is important to conduct an in-depth evaluation of the weaknesses of the current system [8].

4.2. Hardware Requirements Analysis

Hardware is a very important component in supporting an application. Without qualified hardware, an application will not run properly [9]. The minimum hardware specifications required to run this KelaDi application are as follows:

- Processor with a minimum speed of 1 GHz.
- RAM with a minimum capacity of 2 GB.
- Graphics card with a minimum capacity of 256 MB.
- Monitor with 1024 x 768 resolution.

4.3 Development Methods

The minimum software specifications required to run the KelaDi application are the Windows 7 operating system (OS).

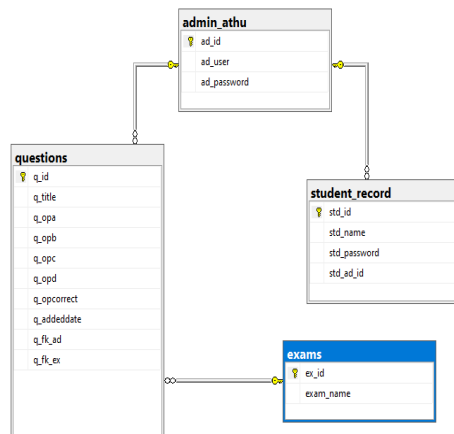
4.4. User Analysis

User analysis aims to understand who the users are involved in the KelaDi application, as well as their characteristics, to determine the level of experience and understanding of this system. The KelaDi application has one type of user, namely users, which consist of students. Students are the main users of the KelaDi application, especially those at the high school level. Their characteristics are that students need easy

access to learning materials, efficient assignment collection, and interactivity in the learning process.

4.5. SQL Database Diagram Relation Schema

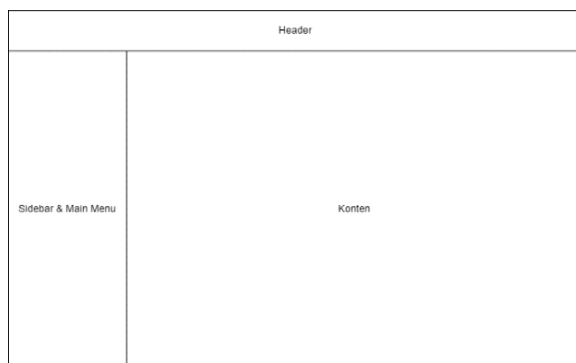
In the development of the KelaDi application, the SQL database diagram relation schema is used to design an efficient and organized data storage structure. The database functions as a data management system that stores important information related to users and activities in the application [10]. There are several main tables in this database schema, namely:



Picture 1. SQL database diagram relation schema using SSMS 20

4.6. Interface Design

An interface is a communication mechanism between the user and the system. The interface can receive information from the user and provide information to the user to help direct the flow of problem tracing until a solution is found [2].



Picture 2. UI design

4.7. Implementation

Implementation is a stage in the planning and development of software which consists of several explanations that discuss the implementation environment, implementation limitations and program implementation.

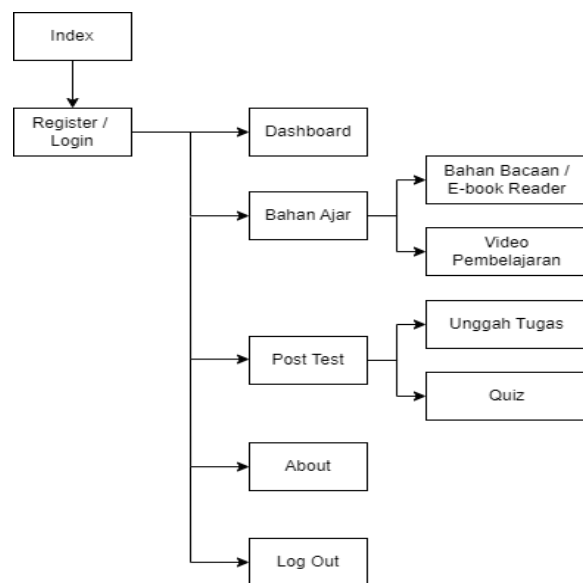
4.8. Software and Hardware Specifications

The software used for the implementation of the design and development of the KelaDi learning media application program is as follows [9]:

- Windows 10 Home Single-Language 64-bit as the operating system.
- Visual Studio 2019 as a C# programming language code editor and visual UI design.
- SQL Server Management System 20 as a database storage manager.

4.9. Menu Structure Implementation

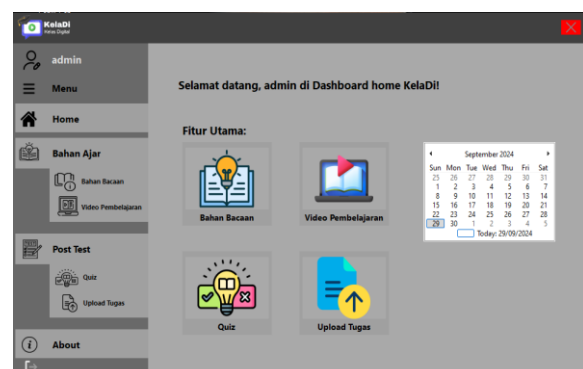
From the menu design that has been prepared, the menu structure of this information system can be created so that it can be seen in the following image.



Picture 3. Menu structure implementation

4.10. User Interface (UI) Implementation

The implementation of the KelaDi application user interface (UI) is the result of UI design that was previously carried out at the design stage.

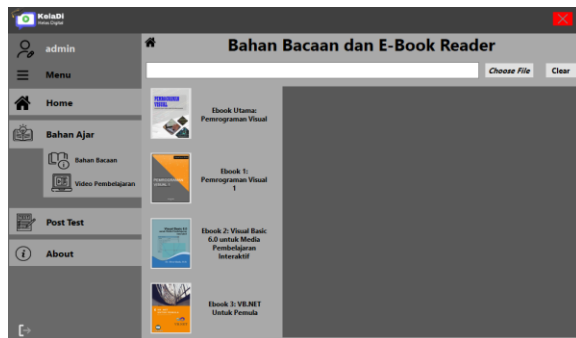


Picture 4. UI implementation

4.11. E-book Reader Features

The e-book reader feature in the KelaDi application allows students to easily access and read

digital learning materials. Students can navigate pages and enlarge text to facilitate independent learning.



Picture 5. E-book reader features

4.12. Learning Video Features

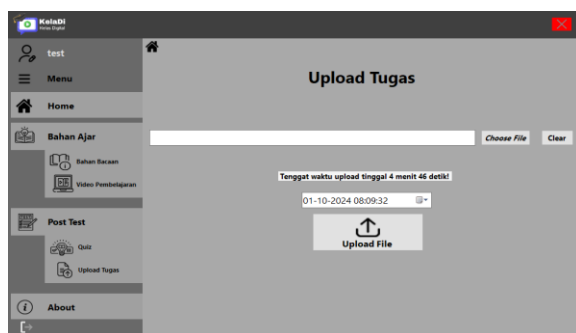
The learning video feature in the KelaDi application allows students to watch video content that supports understanding of the material. This feature helps clarify the concepts taught and allows students to learn in a more interactive and visual way.



Picture 6. Learning video features

4.13. Assignment Upload Feature

The task upload feature on the KelaDi application allows students to upload assignments independently according to the specified deadline. This feature is equipped with a countdown timer that makes it easy to set deadlines for submitting assignments, so that students can be more organized in completing assignments.

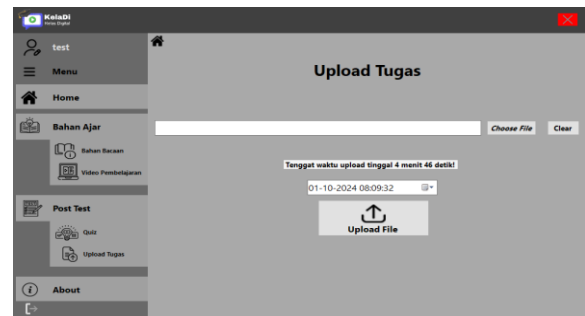


Picture 7. Assignment upload feature

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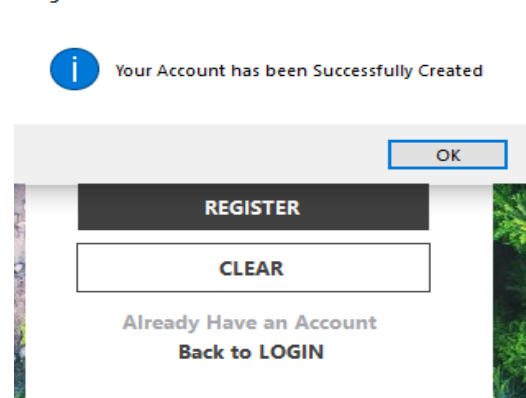
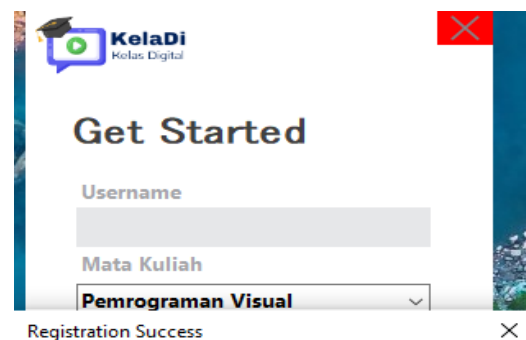
Picture 8. Assignment upload feature

4.15. KelaDi Application Testing

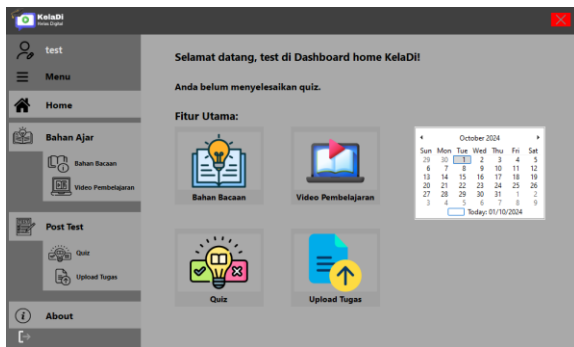
KelaDi application testing is an important step in the software development process that aims to ensure that the application functions according to specifications and meets user needs. This testing includes functional testing and User Experience (UX), to evaluate each feature can run as expected and ensure an optimal user experience [11]. The following are details about the testing carried out on the KelaDi application:

a. Testing the Login and Register Features

This testing is done to ensure that users can register and log in to the KelaDi application responsively.



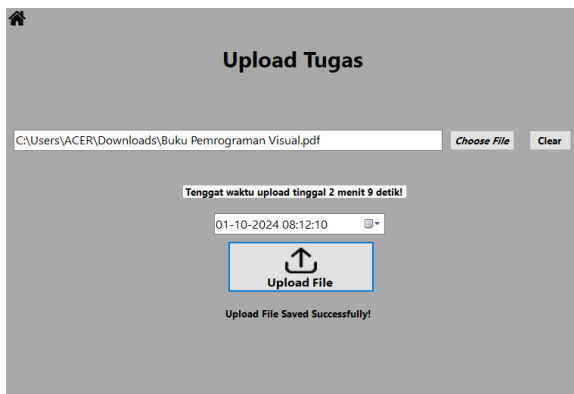
Picture 9. Register display if successful registration



Picture 10. Keladi's initial display if login is successful

b. Trial on Assignment Upload Feature

This testing is done to ensure that students can upload assignments according to the requested file format and that deadlines are recorded correctly.



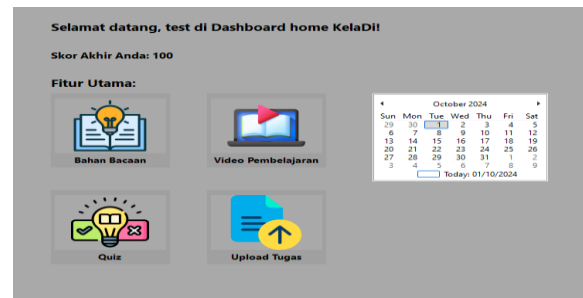
Picture 11. Display the upload task feature if the file upload is successful

c. Trial of the Quiz Feature

This test is to ensure that the quiz questions appear correctly and the assessment runs according to the set score. If you have completed the quiz, the final results will appear on the KelaDi home dashboard.



Picture 12. Trial view of the quiz feature if you have finished working on the questions



Picture 13. Dashboard home display when you have completed the quiz

5. CONCLUSION AND SUGGESTION

The KelaDi application as an interactive learning media based on C# offers an effective solution to improve the quality of the teaching and learning process. Equipped with features such as e-book readers, learning videos, assignment uploads, and interactive quizzes, this application supports digital learning needs. Development using the Waterfall methodology ensures a structured process from needs analysis to implementation. KelaDi has succeeded in overcoming traditional learning challenges, such as lack of interaction between students and teachers and limited access to digital materials. With innovative features, this application makes it easier for students to access materials and assignments, and improves the learning experience. It is hoped that KelaDi will become an important tool in supporting the digitalization of education and student learning outcomes.

Suggestions for further research include the development of the KelaDi application with online discussion features between students and teachers, as well as an automatic assessment system to increase interactivity. It is also recommended to optimize the application on a mobile platform and integrate it with other learning systems such as Google Classroom or Moodle. Improving the interface design (UI) and developing interactive content such as simulations and educational games are also important to make learning more interesting. With these suggestions, it is hoped that KelaDi can develop into a better learning media in supporting the digitalization of education.

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